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DEVICE FOR WIRELESS TRANSMISSION OF A DEPLOYMENT SIGNAL

Background Information

The present invention is directed to a device for wireless transmission of a deployment signal according to the preamble of the independent claim.

DE 100 46 695 A1 describes a device for wireless transmission of a deployment signal, which transmits the deployment signal over a first path and a redundance signal for the deployment signal over a second path. Deployment then occurs on the secondary side only if both the deployment signal and the redundance signal are recognized on the secondary side.

Advantages of the Invention

The device according to the present invention for wireless transmission of a deployment signal, having the features of the independent claim, has the advantage over the related art that there are two processors on both the primary side and the secondary side, these processors being configured in such a way that they exchange data with one another. A high degree of redundancy is thus achieved on the primary and secondary sides, resulting in reliable deployment of the restraining means such as an airbag or a seat belt tightener. The redundance signal and the deployment signal may be analyzed separately.

The measures and refinements recited in the dependent claims permit the device for wireless transmission of a deployment signal named in the independent claim to be advantageously improved.

It is particularly advantageous that the primary side is situated in a steering column and the secondary side is situated in the steering wheel. The device according to the present invention is then suitable for wireless transmission of a deployment signal for an airbag in a steering wheel.

It is furthermore advantageous that the primary side is situated in the vehicle chassis and the secondary side is situated in a vehicle seat. The device according to the present invention is then particularly well-suited for removable seats for which wireless, in particular inductive, transmission is particularly well-suited.

It is furthermore advantageous that a first transceiver for wireless transmission is situated on the primary side and is connected to the two processors situated on the primary side, and on the secondary side a first transceiver block having a first processor is connected to a first terminal of a triggering element and a second transceiver block having a second processor is connected to a second terminal of the triggering element. The transceiver is responsible for the conversion of the signals to be transmitted with respect to frequency and amplitude. The two transceiver blocks are situated on the secondary side for connecting a block to the high side and the low side of the triggering element.

It is furthermore advantageous that the first transceiver block receives the redundance signal via a first winding, and the second transceiver block receives the deployment signal via a second winding. The first winding may be assigned to a power transmitter, and the second winding may be assigned to a data transmitter. As an alternative, it is possible to use a single transmitter having two windings on the secondary side. Electrical filtering may also be provided for separating the deployment signal from the enable signal.

Finally, it is also advantageous that the first transceiver block generates a supply voltage and closes the high-side switch when deployment occurs, while the second transceiver generates and monitors the power reserve and closes the low-side switch when deployment occurs.

Drawing

Exemplary embodiments of the present invention are illustrated in the drawing and explained in greater detail in the description that follows.

Figure 1 shows a first block diagram of the primary side of the device according to the present invention, and

Figure 2 shows a block diagram of the secondary side of the device according to the present invention.

Detailed Description of the Exemplary Embodiments

New airbag generations have a high degree of redundancy in their electronic systems. The microcontroller, as a processor, which performs the analysis and executes the deployment algorithm, is also connected to a safety semiconductor, which also inputs and independently checks the sensor data. Deployment of restraining means occurs only if this safety semiconductor also determines deployment, as long as this is also detected by the microcontroller. Various watchdog monitoring units and other safety structures may also be provided in the triggering circuit.

According to the present invention, the redundancy of the processors, which is achieved using the safety semiconductor and the microcontroller, is extended to the secondary side. On the primary side, a transceiver is connected to the microcontroller and the safety semiconductor acting as the two processors, the transceiver being typically connected to a secondary side via two transmitters, one data transmitter and one power transmitter, the secondary side being situated in the steering wheel or in a removable seat, for example. The secondary side has a transceiver block on the high side and another transceiver block on the low side of the triggering element. A processor, connected to the other processor via a communication line, is situated in each transceiver block. Redundancy similar to that of the primary side may thus also be achieved on the secondary side by using the two processors.

Figure 1 shows in a block diagram the primary side of the device according to the present invention. A transceiver ITIC is connected to a microcontroller µC and a safety semiconductor SCON via two data inputs each. Microcontroller µC is connected to safety semiconductor SCON via a line SPI. Furthermore, a data output of microcontroller µC is also connected to safety semiconductor SCON via a line ECLK. A line VZP for voltage supply is also connected to transceiver ITIC. Transceiver ITIC is connected to a power transmitter 1 via a first output and to a data transmitter 2 via an input/output. Power transmitter 1 and data transmitter 2 are both transformers.

Transceiver ITIC provides the voltage and frequency for power transmission, as well as the voltage and frequency for the enable signal in the redundancy path via power transmitter 1. Furthermore, transceiver ITIC contains means for data transmission via data transmitter 2. Such means are suitable drivers, for example. Microcontroller µC outputs a deployment signal F1 and diagnosis signals F2 via transceiver ITIC. The responses to the diagnosis signals, which are transmitted back to transceiver ITIC by the secondary side via data transmitter 2, are then relayed to microcontroller µC, which then checks and determines the reliability performance of components, in particular of a triggering element. Safety semiconductor or safety controller SCON analyzes sensor signals simultaneously with microcontroller µC to detect a deployment situation. If controller SCON also detects a deployment situation, SCON transmits an enable signal to ITIC; if the safety semiconductor does not detect a deployment situation, controller SCON transmits no signal or a disable signal. The signals relayed by transceiver ITIC to the transmitter(s) are then relayed to the two secondary-side processors for analysis.

Figure 2 shows a block diagram representing the structure of the secondary side of the device according to the present invention. A winding W1 of power transmitter 1 is connected to a transceiver block IRHS and another transceiver block ITLS. A winding W2 of data transmitter 2 is only connected to transceiver ITLS. Transceiver IRHS is connected to a switch 201 and a triggering element Z. Transceiver IRHS is connected to transceiver ITLS via a double line SPI (serial peripheral interface), i.e., a serial data line, enabling the two processors µC, situated in the transceiver blocks, to exchange data. The two transceiver blocks IHRS and ITLS are each connected to a power source 202, here a voltage source. Transceiver ITLS is also connected to the ignitor, specifically to the low side, as well as to a power reserve ER, which is directly connected to a power IC (power semiconductor) in transceiver block ITLS. Transceiver block ITLS has a low-side switch 205, typically a transistor switch, which is closed in the event of deployment. Transceiver block IRHS has a high-side switch 204, which is also closed in the event of deployment to trigger triggering element Z, an ignitor, for example. Furthermore, transceiver block IRHS has an analyzer module 203 for detecting switching signals of switch 201.

Redundancy for improving bidirectional communication via line SPI is achieved on both primary and secondary sides via two microcontrollers µC. Microcontroller µC in transceiver

block IRHS is used for reading steering wheel switch 201 and optionally from sensors. Furthermore, the supply voltage is generated here by power source 202 and the power transmitter, and high-side switch 204 is closed in the event of deployment. The power reserve in capacitor ER is generated and monitored in transceiver ITLS by component PIC (power IC), and low-side switch 205 is closed in the event of deployment. The µC in ITLS also organizes the data transmission to the primary side via winding W2. The processor in transceiver block IRHS analyzes the enable signal which is transmitted via winding W1. The enable signal indicates whether or not SCON has determined deployment. Processor µC in transceiver block ITLS analyzes the deployment command which is transmitted via data transmitter 2 and winding W2. If both processors in transceiver blocks IRHS and ITLS determine deployment based on the signals, only then is triggering element Z triggered by the closing of switches 204 and 205. For this purpose, either the power supply via winding W1 or power source 202 and, optionally, power reserve ER are used.